

and we shall not say what we thought of them. Let us still be just. If we are to condemn them, let it only be after a trial when they are fresh and good. We have indeed tried them in their native country, pounded up with acorns and mashed into balls by the digger Indians of California; but then acorns would destroy any dish for civilised food, so that we prefer to leave the question of their culinary merits an open one for some gastronomic jury, stipulating only for the right of challenging Mr. Riley, as one of its members, on the score of undue favour and partiality arising from too intimate an acquaintance and familiarity with the individuals under trial.

A further contribution to the subject treated of by Mr. Riley has reached us in the shape of the first two *Bulletins* of the United States Entomological Commission.

ANDREW MURRAY

ABNEY'S TREATISE ON PHOTOGRAPHY

A Treatise on Photography. By W. de Wiveleslie Abney, F.R.S. (London: Longmans and Co., 1878.)

ALL those interested in this most attractive study will welcome Capt. Abney's treatise on photography. Those who wish to become acquainted with the scientific principles on which the practice of photography depends will find in the opening chapters a clear and concise description of the theory of sensitive substances, and of the action of light on various compounds, whilst by studying the closing chapters of the volume they will be able to make themselves acquainted with the present state of our knowledge on the important subjects of actinometry, photo-spectroscopy, and the interesting discoveries made by the author and others on the sensitiveness of different salts, and the methods employed for obtaining pictures of the various portions of the spectrum. On the other hand, the artist photographer will find ample matter for interest in the chapter in which Capt. Abney most successfully lays down the rules which must guide the production of an artistic picture, pointing out the special difficulties under which the photographer lies in the choice of subjects in order to avoid incongruity or inartistic massing of light and shade, and showing the best mode of lighting and arranging the picture by choosing the right point of view for the camera. As an illustration of Capt. Abney's happy style and power of artistic treatment, we may quote the following description of a landscape:—

"In the next picture, we have the distance, or perhaps more strictly speaking, the middle distance as the point of interest. The horizon line is kept in the weakest part, the centre, of the picture. The trees in the foreground are so grouped that they frame the view with dark masses, relieved by the light foliage of some of the nearer bushes and shrubs. The foreground finishes at a distance of about $\frac{1}{4}$ from the bottom. More of it would take away from the value of the middle distance, as it would place it in the weakest part of the picture—viz., centrally; less of it would have rendered the picture bald, and have cut off part of the deeper shades which are so valuable in giving the effect of distance to the stream beyond. This picture would have been spoilt had the camera been so placed as to give more top foliage, since the bough which now partially crosses the picture at about $\frac{2}{3}$ the height, would have caused an ugly division, and also the tops of the distant trees, and the sky would have

appeared. This latter, in views such as that under criticism, is objectionable, as patches of white give the eye an inclination to wander off towards it, and it would have been an insufficient precaution to have printed in clouds from another negative, owing to the difficulty that would exist in subduing at the same time the lights on the leaves of the near trees. As it is, the picture is in pictorial focus. By placing the stream to the right or left, the balance would have been wanting, and its general direction would have been altered to such an extent as to have given a feeling that it was a subsidiary part of the picture instead of an essential."

Another important section of the work is devoted to the necessary, but unavoidably dry descriptions of the very numerous photographic processes and manipulations now in vogue, of the construction of apparatus, and a statement of the general laws of geometrical optics so far as concerns the principles on which the construction and use of photographic lenses depend. On all these subjects we find Capt. Abney's statements clear and concise.

Then again no book on photography would be complete without an explanation of the various processes of photo-lithography and photo-engraving, and accordingly we find a short account of the more important of these interesting methods of reproducing photographic effects. To one of these photo-relief printing processes, that discovered by Warnerke, with, we believe, the author's co-operation, we would especially draw attention, the picture being remarkable for the beauty and delicacy, as well as for the force and depth of its tones. The details of this process are not yet published; it cannot, however, be doubted that it is capable of producing the finest effects of a steel or copper-plate engraving.

It is, however, the scientific side of Capt. Abney's book which will especially interest the readers of NATURE. The explanation of the effect of vibration as setting up chemical change in the molecule is clearly set forth in Chapter III. The case in which the atoms are in a stable though verging on an indifferent equilibrium as with the sensitive mixture of chlorine and hydrogen, being well illustrated by the equilibrium of a frustum of a pyramid standing base uppermost on as narrow section of the base as we please. In these cases a very small amount of work is needed to make the systems take up more stable positions. Then "extending our previous illustration, supposing we had a row of such frusta of pyramids, and that it was found that one pellet of a number (all being of equal weight) when striking one frustum with a certain velocity was able to cause it to fall, and also that in every case the accuracy of aim was undoubted, and that in falling one frustum did not strike its neighbour, then at any interval after the commencement of a bombardment the amount of work expended in projecting the pellets could be compared by simply counting the number of frusta which had fallen" (p. 12). The question of the action of vibrations synchronous with the oscillations of the molecule on the stability of the molecule is next discussed, and the explanation rendered clear by a description of Rankine's well-known contrivance of the heavy and light pendulums. The difference between the decomposition of explosives and of bodies employed for photographic purposes in respect to the nature of the disturbing vibrations is thus pointed out. Explosives are affected by long wave rays, photographic actions as a rule being only set up by waves

of short length. A description of the remarkable negative or reversing action effected by the red rays on the sensitised plate, first observed by H. Draper, is found in Chapter XXXIV. A partial explanation of this very interesting fact is given by the results of experiments lately made by Capt. Abney (*Phil. Mag.*, January, 1878), which show that the image can be rendered undevelopable by the oxidation of the altered silver compound forming it. Chastaing has also recently announced that he finds rapidity of oxidation promoted by the red rays. It is thus easy to see that the sensitive salt of silver which had been altered in chemical composition by a slight exposure to white light, would become oxidised where the red rays fell upon it, and that, in consequence, where the dark Fraunhofer's lines in the ultra red spectrum fell, the plate would remain unaffected and the presence of these invisible bands would become apparent.

Another subject of great interest, that of the production of coloured photographic images, is being attacked experimentally by Capt. Abney. The results of the experiments in this direction by Becquerel and Niépce de St. Victor are well known, and many of the visitors to the Loan Exhibition will remember the coloured photograph of dolls dressed in coloured clothes shown by the latter chemist. Abney believes that these tints are rather to be ascribed to different stages of oxidation of the film, than, as has hitherto been supposed, to the colours of thin plates. Then, again, on the subject of the recent discoveries by Vogel, Waterhouse, and others, as to the production of a film sensitive to the red rays by the addition of a red dye to the collodion, Capt. Abney has something original to say. He has found that the addition of certain resins, albumin, and other organic bodies, when combined with silver, tends to lower the limit of the impressible spectrum and the place of maximum sensibility; so much so, indeed, that it is possible to obtain an unreversed impression of the thermal spectrum. A beam of light was allowed to pass through ruby glass, and the spectrum was then thrown on a resinised plate in the ordinary manner, and a visible impression of rays in the red was obtained far beyond the limit of the visible spectrum, as is seen by a figure in the volume.

Enough has been said to show the value of Capt. Abney's treatise both from the scientific and artistic points of view. If we are to speak on the part of amateur photographers we would express a hope that the subject of the explanation of defects in negatives and their cure may be more fully treated of in the next edition. It is perhaps difficult for an accomplished photographer like the author to appreciate the difficulties of a beginner in the art, but the mere mention of some of the defects met with in negatives does not always, as the author states, suggest the cure to minds unfamiliar with the niceties of manipulation and procedure which to the expert come as a matter of course. We congratulate Capt. Abney on the appearance of this most useful volume.

H. E. R.

OUR BOOK SHELF

Archæological Researches at Carnac, in Brittany. By James Miln. (Edinburgh: David Douglas.)

THIS beautiful book reflects great credit on its author. It would be difficult in the recent literature of archæology to point out a more salient example of the great gain

which is sure to accrue to that branch of science from the introduction of the true scientific spirit, and attention to details. Carnac, in most people's minds, is associated with Druidical circles, and it was to see the wonderful alignments there that Mr. Miln visited the place. But while in the region the author was particularly struck with the remains belonging to a very different time, which were pointed out to Mr. Miln by a French archæologist. They are termed the mounds of the Bossenno. With characteristic energy Mr. Miln, who was determined to explore, endeavoured to buy in order that he might explore the better. In this, however, he was foiled, beset by too many difficulties. The permission to explore which he subsequently obtained does not appear to have been a very complete one, and after this big book full of matter our author states that much still remains to be done.

The results of the excavations so carefully carried out by Mr. Miln show that we have here the remains of a Gallo-Roman settlement, and he has reconstructed for us out of its ashes the condition of the people in former times. He has been enabled to give us precise information as to their food and the degree of luxury in which they indulged. Their worship, their ceremonies, and modes of manufacture, and the exact times between which the colony was in a flourishing condition are also fully discussed. He traces the local worship of Venus Genetrix, at the Mont St. Michael, in a most interesting manner. One of the oldest constructions which remains in Brittany is the chapel of St. Agatha. On the vault of the apse a few years ago was discovered one of the most curious frescoes which the Romans have left in Brittany. It represents Venus rising from a blue sea, surrounded by fishes and dolphins. This church, now dedicated to St. Vener, is styled "Ecclesia Sancti Veneris" in a twelfth century charter.

The beautiful illustrations comprise not only almost everything which was found, but large coloured plates of the chief coloured designs rescued here and there.

All antiquaries will do well to lay to heart the remarks on ancient pottery made by Mr. Miln *à propos* of his finds in the excavation which he designates A. He shows abundantly how much caution is requisite in such inquiries and how a careful sifting of facts brings order into what at first sight appears a hopeless jumble of objects. It is curious that some of the pottery he found there is similar to some in the Guildhall Museum, which was found at a depth of forty-two feet, when the ground was excavated for the foundations of the Royal Exchange.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

The Telephone

IN his interesting paper (*NATURE*, vol. xvii. p. 283) Mr. F. J. M. Page communicated as the result of his experiment to obtain indication of currents from a telephone by means of a mercury capillary tube, that the motion of the mercury was "always towards the end of the capillary." In the repetition of this experiment before the Physical Society on Saturday, February 16, Mr. Page found, however, that the mercury moved persistently in the opposite direction.

In the December (1876) number of the *Phil. Mag.* I showed that the motion of mercury in contact with dilute acid through which a current passes, is due to rapid circulation of the mercury set up by deoxidation of one part of its surface whilst another part is being oxidised; and that a very slight difference in the degree of oxidation is sufficient to produce an appreciable electromotive force.